

STATE OF CALIFORNIA
AIR RESOURCES BOARD

AIR MONITORING QUALITY ASSURANCE

VOLUME V

AUDIT PROCEDURES
FOR
AIR QUALITY MONITORING

MONITORING AND LABORATORY DIVISION

FEBRUARY 2003

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5.0.0 OBJECTIVE

The objective of Volume V of the Air Resources Board (ARB) Quality Assurance Manual is to define the responsibilities for conducting system and performance audits and to also provide standardized documented audit procedures and reporting formats. The objective of the audit program is to assure all published air quality data are from approved sites, gathered by trained personnel using approved methods in accordance with well documented procedures, traceable to recognized standards and reported with assessments of their precision and accuracy. The audit program thus assures that air quality data are comparable and can be used with confidence by air pollution control officials, the medical community and others.

5.0.0.1 DEFINITION OF SYSTEM AND PERFORMANCE AUDITS

A system audit is an on-site inspection and review of a monitoring organization's entire program in which the total measurement system is reviewed (sample collection, sample analysis, data processing, etc.). The audit includes a review of staff, standard operating procedures, facilities, and documentation to assure compliance with federal and state air quality monitoring, quality assurance, siting and data reporting regulations (40 CFR Part 58).

A performance audit is an on-site test aimed at challenging the integrity of the air monitoring site's or laboratory's ability to generate data of acceptable quality. Variations in the audit procedures correspond to the type of performance audit being conducted. Performance audit categories are as follows:

- A. Through-the-probe audits (Gaseous Criteria, Gaseous Toxic, and Non-Methane Hydrocarbon (NMHC)). Known concentrations of gases (National Institute of Standards Technology (NIST) traceable) are used to challenge the analyzers. The sampler's measured results are then compared to the actual results.
- B. Sampler flow audits (High and low volume particulate matter of 10 microns or less (PM10), particulate matter of 2.5 microns or less (PM2.5), high and low volume total suspended particulate (TSP), Tapered Element Oscillating Microbalance (TEOM), PM10 and PM2.5 Beta Attenuated Monitor (BAM), carbonyl, and pesticides): Flow measurement instruments (NIST traceable) are used to compare the sampler's measured and actual flow rate.
- C. Laboratory Audits (PM2.5 and PM10 Mass), wet acid deposition, toxic air contaminants, toxic metals (Pb), PM10 ions, Non-Methane Organic Compound (NMOC), Volatile Organic Compound (VOC), motor vehicle, and pesticides): Measured results are compared to actual results using

known quantities of compounds and NIST traceable instrumentation where available.

- D. Meteorological Audits (wind speed, wind direction, temperature, relative humidity, barometric pressure, and solar radiation): Sensors are checked for accuracy using NIST traceable instruments. The measured results are then compared to the actual results.

In addition, a performance audit includes a review of the site, the primary data recording device and the procedures used to record and report data.

5.0.0.2 AUDIT SCHEDULES

System audits are conducted periodically at the ARB and local district facilities. Performance audits are conducted quarterly on at least 25 percent of the State and Local Air Monitoring Stations (SLAMS) for each criteria pollutant. Special Purpose Monitors (SPM from which data are to be used for State Implementation Plans (SIPS) and non-criteria pollutant instrumentation are also audited on a regular basis.

Performance audits are scheduled so that they meet the U.S. Environmental Protection Agency's (EPA) regulations set forth in 40 CFR Part 58. Since some sites are seasonal or have a limited operational window, performance audits are also scheduled to accommodate these factors. Whenever possible, calibrations and audits shall be scheduled at alternating six-month intervals to provide a semi-annual multi-point performance check of each station.

5.0.1 SYSTEM AUDIT PROCEDURES

5.0.1.1 RESPONSIBILITY

System audits of monitoring organizations operating National Air Monitoring Stations (NAMS) are the responsibility of the U.S. EPA. The U.S. EPA may negotiate with private contractors or the ARB to conduct NAMS system audits. In addition to NAMS system audits, the Quality Assurance Section (QAS) of the ARB's Monitoring and Laboratory Division (MLD) also conducts field as well as laboratory system audits of PM10 and PM2.5. The QAS also conducts routine system audits of SLAMS without a subset of NAMS sites as well as other selected private contractors.

5.0.1.2 POLICY

System audit procedures used by the QAS are in accordance with those stipulated in U.S. EPA's Quality Assurance Handbook (EPA-600/4-77-022a, Section 2.0.11). Questionnaires and check sheets are formulated from U.S. EPA's regulations and guidelines for the type of system audit being conducted. These audit questionnaires and check sheets are mailed to the audited organization in advance of the actual on-site visit. The monitoring organization is to complete the

questionnaires and check sheets and return them to the auditors at least one week prior to the on-site visit.

Each system audit will be documented in a preliminary system audit report which will be sent to the audited organization for review. The report will include the findings of the auditors and, whenever necessary, suggested corrective actions. After the audited organization has reviewed the preliminary system audit report, it will be returned to the QAS where the final system audit report will be drafted. It is the responsibility of the audited organization to correct all deficiencies and report such corrections to the QAS and U.S. EPA Region IX quality assurance coordinators. Some deficiencies may be reviewed during the next performance audit.

5.0.1.3 COMPONENTS OF A SYSTEM AUDIT

A. Assessment of the staff:

1. Background and education.
2. Chain of command regarding description of assignments and specific duties.
3. Continued training for staff.
4. Level of staffing.

B. Assessment of facilities:

1. Review questionnaires and check sheets with staff at site.
2. Review laboratory practices.
3. Review field activities.
4. Inspect laboratory and support facilities.
5. Review monitoring sites with respect to stated siting criteria and representativeness requirements.
6. Audit controlled environment (temp, RH etc.) as required by U.S. EPA guidelines.

C. Assessment of data and document control:

1. Review chain-of-custody forms.
2. Review laboratory daily operational records.
3. Review field documentation and records.
4. Review the reporting format including the process used to upload data.
5. Review the process and how long the data will be archived.

D. Assessment of the quality control programs:

1. Review the Standard Operating Procedures.
2. Review adequacy and adherence to procedures.

5.0.2 PERFORMANCE AUDIT PROCEDURES

5.0.2.1 RESPONSIBILITY

The Quality Assurance Section (QAS) of the Air Resources Board's (ARB) Monitoring and Laboratory Division is responsible for preparing and implementing these audit procedures. The auditors shall be QAS staff and work independently of the operator/analyst functions of the ARB's air quality surveillance program.

5.0.2.2 POLICY

- A. Whenever possible, audits shall be conducted with a staff member of the monitoring organization present.
- B. Monitoring personnel shall provide the auditor with the instrument's make, model, identification number, equivalency certification number, operating parameters, and responses of the audits as read from the primary data recording device. Variations in the audit procedures correspond with the type of performance audit being conducted.
- C. The operating agency is responsible for correcting deficiencies found during the audit.
- D. The QAS shall calculate and report data accuracy estimates for reference and equivalent method analyzers operated as SLAMS within the ARB reporting organization. Procedures for calculating and reporting data accuracy estimates are presented in Volume I of this manual.
- E. The auditors will not make instrument adjustments (e.g. adjustments to potentiometer, replacement of parts, etc.). However, after the initial audit points are taken, the attending monitoring personnel may perform maintenance and make repairs. If such repairs are made at the time of the audit and schedules permit, the auditors will perform a series of post audit checks to verify accurate analyzer or sampler performance. If the nature of the adjustments and/or repairs are such as would normally require a recalibration of the instrument, the audit shall not suffice as a recalibration. However, the data taken between time of the post audit checks and the recalibration, shall be validated and reported if the instrument's "as is" performance at the time of the recalibration is within acceptable accuracy limits.
- F. All audit standards shall be certified and traceable to either NIST standards or other authoritative standards.

5.0.2.3 PREAUDIT CONTACTS

- A. The auditor will contact the organization to be audited one or two weeks prior to audit date. During the contact, the auditor will verify and confirm the following:
 - 1. Date and time that each site will be audited.
 - 2. Samplers and instruments operating at the site and if all equipment are in working order.
 - 3. Calibration dates, serial numbers, and other pertinent information available at the time of the audit.
 - 4. Any special situations such as parking, locks/codes, directions, etc.
 - 5. Develop cooperation so that those instruments found operating outside the ARB's control limits will be remedied quickly.
- B. An email will be sent to the organization to be audited confirming the above information.

5.0.2.4 EQUIPMENT REQUIREMENTS

Specific equipment requirements for each audit procedure are listed in each Appendix.

5.0.2.5 AUDIT DOCUMENTATION AND FORMS

- A. The vehicle inspection list (Figure 5.0.2.1) is checked off before each audit trip to ensure that all the required audit equipment is present. All pertinent site information such as site topography, site dossier, and site location are printed out and reviewed before an audit trip.
- B. The QAS audit program contains preliminary audit results as well as the Site Survey Report (Figure 5.0.2.2). Data such as longitude, latitude, station temperature, siting report, cleaning schedule, calibrations, in-line filter changes, etc., are inputted in the above report.
- C. Audit data are entered on the Audit Worksheets (Figure 5.0.2.3) to report preliminary audit results. This audit data is then transferred into the QAS audit program where audit calculations are processed using certified standards.
- D. Audit results from the QAS audit program are printed at the end of the audit and reviewed with the site operator.

5.0.2.6 AUDIT REPORTS

- A. Quarterly and annually, audit results for criteria pollutants are reported to the EPA showing individual and polled data accuracy estimates. These results are calculated using EPA's data analysis and reporting methods (40 CFR Part 58, Appendix A). See Volume I of this manual for procedures and formats for calculating these estimates.
- B. Quarterly and annually, audit results for non-criteria and criteria pollutants are compiled and posted on the internet at <http://www.arb.ca.gov/aaqm/qmosqual/qmosqual.htm>

5.0.2.7 CORRECTIVE ACTIONS

Whenever an audit indicates an exceedance of the accuracy limits, an Air Quality Data Action (AQDA) request (Figure 5.0.2.4) will be initiated. The AQDA withholds data from entering the ARB's data files until investigation and necessary corrective actions are taken and reported. If necessary, the data are corrected. If data corrections cannot be made, the data shall be invalidated back to the initial occurrence of the malfunction. If the date and time of the malfunction cannot be verified, data shall be invalidated back to the last successful calibration, span, check, or audit.

Variations in the accuracy limits correspond with the type of analyzers or instruments being audited. Accuracy limits are listed below:

- A. Gaseous analyzers:
 - $\pm 15\%$ from true.
 - $\pm 10\%$ from true, results in warning.
- B. Flow samplers
 - 1. PM10, TEOM, PM10 BAM, Xontech 920:
 - $\pm 10\%$ from true.
 - $\pm 10\%$ from design.
 - $\pm 7\%$ from true, results in warning.
 - 2. PM2.5, PM2.5 BAM:
 - $\pm 4\%$ from true.
 - $\pm 5\%$ from design.
 - 3. Total Suspended Particulates (TSP).
 - $\pm 15\%$ from true
 - $\pm 10\%$ from true , results in warning

4. Pesticides:
 - $\pm 10\%$ from true.
 - $\pm 7\%$ from true, results in warning.
- C. Acid deposition instrumentation where the comparison of pH measured in field (FpH) against pH measured in the laboratory (LpH):
 - If $\text{pH} \leq 5.0$ and $(\text{LpH} - \text{FpH}) \geq 0.2$, flag suspicious data.
 - If pH is between 5.0 and 9.0 and $(\text{LpH} - \text{FpH}) > 0.5$, flag suspicious data.
- D. Laboratory instrumentation
 1. PM10 Ions:
 - Accuracy limits based on approved standard's control limits.
 2. Mass:
 - See U.S. EPA's Quality Assurance Document 2.11 (PM10)
 - See U.S. EPA's Quality Assurance Document 2.12 (PM2.5)
 3. Lead (EPA audit):
 - $\pm 16\%$ based on 90th percentile control limits. See EPA's Quality Assurance handbook (Volume II, Section 2.8).
 4. Toxic Metals (Lead only):
 - $\pm 20\%$ from true.
 5. NMOC instrumentation:
 - $\pm 20\%$ from true.
 6. VOC instrumentation:
 - $\pm 20\%$ from true.
 7. Motor vehicle instrumentation:
 - $\pm 20\%$ from true.
 8. Dioxins:
 - Accuracy limits are currently being developed.
- E. Meteorological instrumentation
 1. Horizontal or vertical wind speed:
 - ± 25 m/s of true at speeds < 5 m/s.
 - $\pm 5\%$ of true at speeds above 5 m/s.
 - Starting threshold – Less than or equal to 0.5m/s

2. Wind direction:
 - Less than or equal to 5° combined accuracy and orientation error.
 - Starting threshold – Less than or equal to 0.5m/s
3. Ambient temperature:
 - ±0.5° Celsius for the Photochemical Assessment Monitoring Station (PAMS) sites.
 - ±1.0° Celsius for the Prevention of Significant Deterioration (PSD) sites.
4. Barometric pressure:
 - ±7.50mm of Hg.
5. Relative Humidity:
 - ±5% for 0% to 10% RH.
 - ±3% for 10% to 95% RH.
 - ±5% for 95% to 100% RH.
6. Solar Radiation:
 - ±5.0% for 25 Watts/m²

Auditors: _____ / _____ Date _____ Van _____
Revised: Jan. 28, 2003

GMC I and II Van Inventory

1. _____ Lap top
2. _____ Cellular phone
3. _____ Camera
4. _____ GPS
5. _____ Site folders
6. _____ Standards file
7. _____ Audit forms
8. _____ PM10 mass analysis weights
9. _____ Check cylinder pressures.
10. Batteries
 - a. _____ 9V
 - b. _____ D cell
 - c. _____ "AA"
 - d. _____ Rechargeable AA
11. Tape
 - a. _____ duct
 - b. _____ masking
 - c. _____ electrical
 - d. _____ teflon
12. Stationery supplies
 - a. _____ Chart paper
 - b. _____ Printer paper
 - c. _____ Recorder ink cartridge
 - d. _____ Printer ink cartridge
 - e. _____ Postits
 - f. _____ Clipboards
 - g. _____ Pencils
13. _____ PM2.5/flow accessory box
 - a. _____ Chionook & manometer
 - b. _____ PM2.5/TEOM/dichot filters
 - c. _____ Flow adapter
 - d. _____ Wrenches
 - e. _____ Caps and plugs
14. _____ PM10 audit bag
 - a. _____ Dickson charts
 - b. _____ PM10/TSP filters
 - c. _____ LCD thermometer
15. _____ Tie wraps
16. _____ Glass manifold
17. _____ Glass "T"
18. _____ Vol-o-flow
19. _____ 0-10L rotometer
20. _____ Regulators (spare)
21. _____ Tape measure, 60 meter
22. _____ Barometer
23. _____ Tubing, miscellaneous
24. Gloves
 - a. _____ Rubber
 - b. _____ Disposable
 - c. _____ Leather
25. _____ Tools/tool box
26. _____ Walkie talkies
27. _____ Thermos containers
28. _____ Extension cords
29. _____ Rope
30. _____ Eppley pyranometer
31. _____ Meteorological audit kit
32. _____ Compass and tripod
33. _____ Ozone transfer standard
34. _____ Mass flow meter
35. _____ RH instrument
 - a. _____ RH box desiccant dry (blue?)
 - b. _____ Distilled H₂O.
 - c. _____ Syphon
36. Leatherman tools (2) _____
37. Vehicle equipment
 - a. _____ Battery charger
 - b. _____ Anti-freeze
 - c. _____ Brake fluid
 - d. _____ Oil
 - e. _____ Power steering fluid
 - f. _____ Jumper cables
 - g. _____ Flares
 - h. _____ Safety highway kit
 - i. _____ Traffic hazard cones
 - j. _____ Water hose
 - k. _____ Fire extinguisher
 - l. _____ First aid kit
 - m. _____ Toilet chemical
38. Start engine _____

Figure 5.0.2.1
Vehicle Inspection List

California Air Resources Board
Preliminary Performance Audit Report by
Quality Assurance Section
Monitoring and Laboratory Division

Manager: Michael Miguel

Phone: (916) 324-6191



AIRS Number: 060790005

ARB Number: 40850

Site Name:
Paso Robles

Audit Date:
2002-04-08

Auditors:
Michael Werst
Fred Burriell

Station Operator:
Phil Wagner

Report Contents:
Executive Summaries
Technical Appendices
Audit Calculations
Site Survey Report

Figure 5.0.2.2
QAS Audit Program

Executive Summary - Gaseous Criteria

Site Name: Paso Robles

Audit Date: 2002-04-08

Parameter	Audit Level	Station Percent Difference	Pass/Fail
Ozone	Low	-4.5	Pass
	Mid	-3.4	Pass
	High	-3.2	Pass

Figure 5.0.2.2
QAS Audit Program (cont'd)

Executive Summary - Samplers (Flow Rate)

Site Name: Paso Robles

Audit Date: 2002-04-08

Parameter	Station Percent Difference	Station Percent Difference From Design	Percent Difference Pass/Fail	Design Difference Pass/Fail
PM10	0.7	0.5	Pass	Pass

Figure 5.0.2.2
QAS Audit Program (cont'd)

Executive Summary - Meterological Sensors

Site Name: Paso Robles

Audit Date: 2002-04-08

Audit Parameter & Level	Station Ind.	Van Act.	Diff. or % Diff	Pass/Fail
Horizontal Wind Speed Threshold			0.3 (m/s)	Pass
Horizontal Wind Speed (Level 1)	0.00	0.00	0.00 m/s	Pass
Horizontal Wind Speed (Level 2)	8.27	8.27	0.00 m/s	Pass
Horizontal Wind Speed (Level 3)	16.27	16.26	0.01 m/s	Pass
Horizontal Wind Speed (Level 4)	24.26	24.26	0.00 m/s	Pass
Horizontal Wind Speed (Level 5)	32.24	32.25	-0.01 m/s	Pass
Ambient Temperature (Hot)	0.2	0.0	0.2 °C	Pass
Ambient Temperature (Warm)	25.3	25.0	0.3 °C	Pass
Ambient Temperature (Cold)	46.6	46.3	0.3 °C	Pass
Wind Direction Threshold			0.31 (m/s)	Pass
Orientation Error			-0.5 °	
Wind Direction	86.5	90	-3.5°	Pass
Wind Direction	178.5	180	-1.5°	Pass
Wind Direction	269.5	270	-0.5°	Pass
Wind Direction	359.5	360	-0.5°	Pass
Wind Direction	446.5	450	-3.5°	Pass

Figure 5.0.2.2
QAS Audit Program (cont'd)

Technical Appendix - Ozone

Audit Information

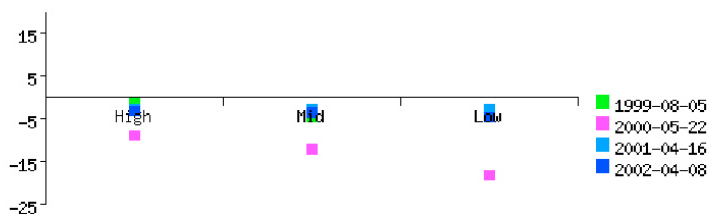
Audit Point	Audit Indicated	Audit Actual	Station Indicated	Station Actual	Percent Difference
Pre Zero	-0.001	-	0.000	-	-
High	0.412	0.409	0.396	0.396	-3.2
Mid	0.176	0.175	0.169	0.169	-3.4
Low	0.067	0.067	0.064	0.064	-4.5
Post Zero	-0.001	-	0.000	-	-
Av % Diff	Zero Ave	Standard Deviation	Corr	Upper 95 Prob Limit	Lower 95 Prob Limit
-3.7	-0.001	0.7	1.00000	-2.3	-5.0

Failures and Warnings

All audit parameters are within specified limits!

Audit Data Comparison

Station 03 Monitor Response



Instrument/AIRS Information

ARB Number 40850
Audit Date 2002-04-08
Van B
Quarter 2

AIRS Number 060790005
Inst. Make and Model API 400
Serial Number 20003837
Last Cal Date 2002-02-07

Comments

Figure 5.0.2.2
QAS Audit Program (cont'd)

Technical Appendix - ARB PM10

Audit Information

Audit Pressure Drop (inches H2O)	Audit Flow (CFM)	Station Magnehelic Reading	Station Flow (CFM)	Audit Average	Percent Difference	Percent Difference from Design
3.06	40.1	-				
3.07	40.2	-				
3.07	40.2	20.0	40.5	40.2	0.7	0.5

Temperature 19.2
Ambient Pressure (mmhg) 741

Design flow rate limits are 36 to 44 CFM for PM10 SSI samplers.

Failures and Warnings

All audit parameters are within specified limits!

Instrument/AIRS Information

ARB Number 40850
Audit Date 2002-04-08
Van B
Quarter 2

AIRS Number 060790005
Inst. Make and Model Sierra Andersen SA 1200
Serial Number 20004187
Last Cal Date 2002-03-25

Comments

Figure 5.0.2.2
QAS Audit Program (cont'd)

Technical Appendix - Outdoor Temperature

Audit Information

Audit Display Reading	Audit Temperature (C)	Station Indicated Temperature (C)	Station Actual Temperature (C)	Degree Difference
0.0	0.0	0.2	0.2	0.2
25.0	25.0	25.3	25.3	0.3
46.3	46.3	46.6	46.6	0.3

Failures and Warnings

All audit parameters are within specified limits!

Instrument/AIRS Information

ARB Number	40850	AIRS Number	060790005
Audit Date	2002-04-08	Inst. Make and Model	MET ONE 060A-2
Van	B	Serial Number	N/A
Quarter	2	Last Cal Date	2002-02-07

Comments

Figure 5.0.2.2
QAS Audit Program (cont'd)

Technical Appendix - Wind Direction

Audit Information

Station Direction	Audit Direction	Degree Difference	Boom Orientation
87	90	-3.5	Compass Reading 346
179	180	-1.5	Sensor Alignment 360
270	270	-0.5	Declination 14.5
360	360	-0.5	True Alignment 360.5
447	450	-3.5	Alignment Error -0.5

Torque Measurements

Measured Torque	3.6
Starting Threshold	0.31
K Factor	38
Highest Allowable Torque	9.5

Failures and Warnings

Based on PAMS Criteria for wind direction alignment, the sensor passes the audit.
Based on PAMS Criteria for starting threshold, the sensor passes the audit.

Instrument/AIRS Information

ARB Number	40850	AIRS Number	060790005
Audit Date	2002-04-08	Inst. Make and Model	MET ONE 020-C
Van	B	Serial Number	W1488
Quarter	2	Last Cal Date	2002-02-07

Comments

Figure 5.0.2.2
QAS Audit Program (cont'd)

Technical Appendix - Horizontal Wind Speed

Audit Information

Audit Reference (RPM)	Audit Actual Speed (m/s)	Station Speed (Knots)	Station Speed (m/s)	PAMS Failure Limits	Actual Differences
0	0.00	0.54	0.00	+/- 0.2 m/s	0.00 m/s
300	8.27	16.08	8.27	+/- 0.6 m/s	0.00 m/s
600	16.26	31.63	16.27	+/- 1.0 m/s	0.01 m/s
900	24.26	47.17	24.26	+/- 1.4 m/s	0.00 m/s
1200	32.25	62.68	32.24	+/- 1.8 m/s	-0.01 m/s

Torque Measurements

Measured Torque	0.1
Starting Threshold	0.3
K Factor	1.4
Highest Allowable Torque	0.4

Failures and Warnings

All audit parameters are within specified limits!

Instrument/AIRS Information

ARB Number	40850	AIRS Number	060790005
Audit Date	2002-04-08	Inst. Make and Model	MET ONE 010-C
Van	B	Serial Number	20003671
Quarter	2	Last Cal Date	2002-02-07

Comments

Figure 5.0.2.2
QAS Audit Program (cont'd)

Audit Calculations

Site Name: Paso Robles

Audit Date: 2002-04-08

Ozone Analyzer Certification Equation

$$\text{Audit Actual} = (((\text{Audit Indicated} - \text{Zero Ave}) * \text{Slope} + \text{Intercept}) * (1 - \text{Line Loss}/100))$$

Slope	Intercept	Line Loss	Zero Ave
0.99160	0.00000	0.24%	-0.001

ARB PM10

$$\text{Audit Flow} = \text{BGI Slope} * ((\text{Audit Pressure Drop} * (\text{Temperature} + 273.15)) / \text{Pressure})^{1/2} + \text{Intercept}$$

Audit Slope	Audit Intercept
35.6000	0.9790

Outdoor Temperature

$$\text{Audit Temperature} = (\text{Audit Display Reading}) * \text{Slope} + \text{Intercept}$$

Slope	Intercept
1.00000	0.00000

Figure 5.0.2.2
QAS Audit Program (cont'd)

Audit Calculations

Site Name: Paso Robles

Audit Date: 2002-04-08

Wind Direction

Starting Threshold = (Measured Torque/K Factor)^{1/2}
Highest Allowable Torque = K Factor * 0.25
True Alignment = Declination + Compass Reading
Alignment Error = True Alignment - Sensor Alignment
Degree Difference = Station Direction - Audit Direction + Alignment Error

K Factor

38.00

Horizontal Wind Speed

Starting Threshold = (Measured Torque/K Factor)^{1/2}
Highest Allowable Torque = K Factor * 0.25
Audit Actual Speed = Audit Reference * Slope + Intercept
Station Speed (m/s) = Station Speed * Conversion Factor

Slope	Intercept	K Factor	Conversion Factor
0.026651	0.270000	1.40	0.5144

Figure 5.0.2.2
QAS Audit Program (cont'd)

Site Survey Report

Siting Information

Site Name: Paso Robles	Audit Date: 2002-04-08	ARB Number: 40850	AIRS Number: 060790005
Address: 235 Santa Fe Av Paso Robles, CA 93446	Latitude: 35° 36' 53"	Longitude: 120° 39' 18"	Elevation (m): 248
	Auditors: Michael Werst Fred Burriell	Site Contact: Phil Wagner	Site Phone: (805)237-9614
Operating Agency: California Air Resources Board		Site Report: Yes	Site Photos: Yes

General Siting Conditions

Station Temperature	Traffic	Topography	Predominant Wind Direction: South
Controlled: Yes	Description: Arterial	Site: Level	Arc Air Flow (Deg): 360 Degrees
Recorded: Yes	Distance: 92 meters	Region: Hilly	Probe Clean: Yes
Inside Temp: 23 Degrees Celsius	Count (Veh/Day): 11800	QA Manual	Manifold Clean: Yes
Meteorology	Non-vehicular Local Sources	Approved: Yes	Cleaning Schedule: Annually
Located With Instruments: Yes	Description: None	Agency: ARB	Autocalibrator Type: API 400 IZS
Shadowing: No	Distance: 0 meters	Urbanization: Suburban	Site Survey Complete: Yes
Boom Orientation (Deg): 346	Direction:	Ground Cover: asphalt	Logbook Up To Date: Yes
Temp(Motor/Natural): Motor			

Action Items

* GPS verified and should be changed to 35 36' 53" and 120 39' 18" @ 248 meters.

Figure 5.0.2.2
QAS Audit Program (cont'd)

Site Survey Report (Cont.)

Monitor Type	Ozone	PM10-SSI	Outdoor Temperature	Wind Direction
Manufacturer/Model	API 400	Sierra Andersen SA 1200	MET ONE 060A-2	MET ONE 020-C
Serial Number	20003837	20004187	N/A	W1488
POC	1	1	1	1
Data For Record?	Yes	Yes	Yes	Yes
Purpose	SLAMS	SLAMS	Other	Other
Objective	Representative Concentration	Representative Concentration		
Scale	Neighborhood	Neighborhood		
Height Above Ground	6.6	5.1	3.5	10.0
Height Above Platform	3.0	1.5	1.0	
Sampler Spacing				
Current Manual (SOP) Available?	Yes	Yes	Yes	Yes
Instrument Log Up-to-date?	Yes	Yes	Yes	Yes
In-line Filter Change Date	2002-04-05			
Cal. Gas Cert. Date				
Calibration Current?	Yes	Yes	Yes	Yes
Calibration Date	2002-02-07	2002-03-25	2002-02-07	2002-02-07
Cal. Equipment Cert. Date	2002-02-07	2001-07-16	2000-07-01	Not Available
Obstacle Description	None	None	None	None
Distance to Obstacle	-	-	-	-
Height Above Inlet	-	-	-	-
Distance to Walls, etc.	-	-		
Distance to Dripline	-	-		
Dominant Influence	Vehicular	Vehicular		
Residence Time (sec)	9.3			

Monitor Type	Horizontal Wind Speed
Manufacturer/Model	MET ONE 010-C
Serial Number	20003671
POC	1
Data For Record?	Yes
Purpose	Other
Objective	
Scale	
Height Above Ground	10.0
Height Above Platform	
Sampler Spacing	
Current Manual (SOP) Available?	Yes
Instrument Log Up-to-date?	Yes
In-line Filter Change Date	
Cal. Gas Cert. Date	
Calibration Current?	Yes
Calibration Date	2002-02-07
Cal. Equipment Cert. Date	Not Available
Obstacle Description	None
Distance to Obstacle	-
Height Above Inlet	-
Distance to Walls, etc.	
Distance to Dripline	
Dominant Influence	
Residence Time (sec)	

Figure 5.0.2.2
QAS Audit Program (cont'd)

QA AUDIT WORKSHEET STATION DATA

Site Name: _____ Site Number: _____ Date: _____
Address: _____ Site Phone Number: _____
Data Read From: Chart[] DAS[] Other[] Type: _____
Correction For Zeroes: YES[] NO[] Booster Pump Flow Rate: _____
Station Manifold Pressure: Before Audit: _____ During Audit: _____

Instrument Range And Response								Ozone Off		Ozone On	
Audit Point	O3	CO	THC	CH4	NMHC	SO2	H2S	NO	NOX	NO	NOX
Range (ppm)											
Pre-Zero											
High-1st Pt.											
Med-2nd Pt.											
NOX-1st Pt.											
NOX-2nd Pt.											
Low-3rd Pt.											
NOX-Opt Pt.											
Post-Zero											

Station Instrument Information					
Instruments	Ozone	CO	NMHC	SO2/H2S	NO/NOX
Manufacturer					
Model Number					
Property Number					
Calibration Date					
EPA Equivalency #					
Slope/Intercept					
Indicated Flow					
In-Line Filter Change					
Converter Temperature					

Calibration Equipment			
Equipment	Equipment Type	Identification Number	Certification Date
Calibration Gas			
Hi-Vol Calibrator			
Gas Calibrator			
Ozone Calibrator			

Figure 5.0.2.3
Audit Worksheet

QA AUDIT WORKSHEET AUDIT VAN DATA

Site Name _____ Date _____
Site Num: _____ Auditors _____
Van: A[] B[] C[] D[] E[] Van Flow _____ Sta. Flow _____
Quarter: 1[] 2[] 3[] 4[] Standards Version _____ Year _____

Van Ozone Responses					
Audit Point	1	2	3	4	5
Ozone Setting	0	400	175	70	0
Display Reading					

Van CO Calibration Responses							
Pre-Audit Responses					Post-Audit Responses		
API 701	High CO	Low CO	Ultrapur		API 701	High CO	Ultrapur

Van CO Dilution Responses								
Audit Point	Audit Mode	Target Ozone	Target		Actual		CO Set Point	CO Display Reading
			Air	Gas	Air	Gas		
	Pre-Zero							
	High							
	Middle							
	NO2							
	Option							
	NO2							
	Low							
	NO2							
	Opt NO							
	Post-Zero							

Figure 5.0.2.3
Audit Worksheet (cont'd)

QA AUDIT WORKSHEET PM10 AND TSP

Site Name: _____ Site #: _____ Date: _____
Address: _____ Agency: _____
Technician: _____ Auditors: _____

Model: _____ ID#: _____ NAMS[] SLAMS[] PAMS[] SPM[]

Station Instrument Flow Rate			
Run 1	Run 2	Run 3	Average

Audit Orifice DeltaP			
Run 1	Run 2	Run 3	Average

Cal. _____ Magnehelic _____ EPA Equiv. _____ Collocated _____ Passed FCT _____
Date: _____ Reading: _____ Number: _____ Yes[] No[] Yes[] No[]

Cal. Equip. Cert Date: _____ Slope: _____ Intercept: _____ Baro: _____ Temp: _____ °C

Model: _____ ID#: _____ NAMS[] SLAMS[] PAMS[] SPM[]

Station Instrument Flow Rate			
Run 1	Run 2	Run 3	Average

Audit Orifice DeltaP			
Run 1	Run 2	Run 3	Average

Cal. _____ Magnehelic _____ EPA Equiv. _____ Collocated _____ Passed FCT _____
Date: _____ Reading: _____ Number: _____ Yes[] No[] Yes[] No[]

Cal. Equip. Cert Date: _____ Slope: _____ Intercept: _____ Baro: _____ Temp: _____ °C

Model: _____ ID#: _____ NAMS[] SLAMS[] PAMS[] SPM[]

Station Instrument Flow Rate			
Run 1	Run 2	Run 3	Average

Audit Orifice DeltaP			
Run 1	Run 2	Run 3	Average

Cal. _____ Magnehelic _____ EPA Equiv. _____ Collocated _____ Passed FCT _____
Date: _____ Reading: _____ Number: _____ Yes[] No[] Yes[] No[]

Cal. Equip. Cert Date: _____ Slope: _____ Intercept: _____ Baro: _____ Temp: _____ °C

Figure 5.0.2.3
Audit Worksheet (cont'd)

QA AUDIT WORKSHEET WIND SPEED AND DIRECTION

Site Name: _____ Site #: _____ Date: _____
Address: _____ Agency: _____
Technician: _____ Auditors: _____
Data Read From: Chart[] DAS[] Other[] DAS Type: _____

Wind Speed Audit		
Audit Test Point	Station Sensor Response	Motor Speed (RPM)
1		
2		
3		
4		
5		
6		

Wind Speed Units
M/S []
MPH []
KNOTS []
FT/S []
KPH []
CM/S []

Wind Direction Audit		
Audit Test Point	Station Sensor Response	Audit Direction Fixture
1		
2		
3		
4		
5		
6		

Audit Parameters	Wind Speed	Wind Direction
Measured Torque (gm/cm)		
Measured Boom Alignment Using Compass (deg)		
Vane Alignment With Boom (deg)		

Station Instrument Parameters		
Sensor Specifications	Wind Speed	Wind Direction
Manufacturer:		
Model Number:		
Serial Number:		
Operating Range:		
Sensor Height:		
K Factor		
Slope and Intercept		
Site Declination:		
Last Calibrated:		
Calibration Equipment Certification Date:		

Figure 5.0.2.3
Audit Worksheet (cont'd)

AIR QUALITY DATA ACTION REQUEST

(For ARB Use Only)

SITE NAME: _____	REQUEST LOG #: _____
SITE NUMBER: _____	AIRS#: _____
REQUEST DATE: _____	
<p>To: _____, Air Monitoring/APCD. Please investigate the potential inaccuracies listed below * and recommend appropriate action/s. If no response to this action is received by _____ QA staff shall review and recommend appropriate action/s.</p> <p>To: <u>Dwight Oda</u>, Air Quality Data Review. Please withhold the following air quality data from processing until potential data inaccuracies</p> <p>FROM: _____, Quality Assurance Section.</p>	
* Potential Data Inaccuracies	

POLLUTANT	EST. TIME PERIOD *	REASON FOR ACTION
	FROM: _____	

CODE	Month Day Year	
	To: _____	
See Attached List	Month Day Year	

Air Monitoring/APCD to complete the following block from their quality control records, sign, and return to Quality Assurance Section. * Exact interval to be determined by district.

RECOMMENDED DATA ACTION	TIME PERIOD (INCLUSIVE)	[‡] CORRECTION FACTOR
RELEASE: _____	BEGIN: _____	
CORRECT [‡] : _____	END: _____	*NULL CODE
INVALIDATE *: _____	Hour Month Day Year	

JUSTIFICATION

REVIEWED BY:	1. _____	DATE: _____	
	2. _____	DATE: _____	
	3. _____	DATE: _____	
	4. _____	DATE: _____	

The recommended data actions were applied and the air quality data were updated on the AIRS/ADAM Database by _____ on _____.

MLD-40/10/00

Figure 5.0.2.4
Air Quality Data Action (AQDA)

VOLUME V – APPENDICES

<u>APPENDIX</u>		<u>PAGES</u>	<u>REVISION</u>	<u>DATE</u>
A	Performance Audit Procedures Using Ambient Level Cylinders (Used only for special circumstances)	6	1	08/01/83
B	Performance Audit Procedures Using Dilution Techniques (Used only for special circumstances)	6	1	08/01/83
C	Performance Audit Procedures for Ozone Analyzers Using a Portable Ozone Transfer Standard	8	4	10/03/02
D	Performance Audit Procedures for High-Volume Samplers	12	2	10/29/02
E	Performance Audit Procedures for Thru-the Probe Criteria Pollutant Audits	35	5	03/06/02
F	System Audit Procedures for Acid Deposition	75	0	01/01/88
G	Performance Audit Procedures for Acid Deposition	16	1	11/22/96
H	Performance Audit Procedures for Low-Volume Samplers (Modified Dichot) (No longer in use – superseded by Appendix P)	3	N/A	03/01/87
I	Performance Audit Procedures for Particulate Measurement (PM10) Samplers	21	3	10/03/02
J	Performance Audit Procedures for Thru-the-Probe Toxic Audits	13	3	08/05/02
K	Performance Audit Procedures for PM10 Ions Lab Audits	6	2	08/22/02
L	Performance Audit Procedures for Toxic Air Sampler (Xontech 920)	15	5	08/01/02

VOLUME V – APPENDICES (cont'd)

<u>APPENDIX</u>	<u>PAGES</u>	<u>REVISION</u>	<u>DATE</u>
M Performance Audit Procedures for Toxic Air Contaminants – Lab Audits	10	2	09/27/02
N Performance Audit Procedures for Light-End and Mid-Range Non-Methane Hydrocarbon Pollutants – Lab Audits	12	1	08/24/02
O Operating Procedures for Global Positioning System	14	2	08/30/02
P Performance Audit Procedures for PM10 Dichotomous Samplers	18	4	09/18/02
Q Performance Audit Procedures for Lead (Pb) Analysis TSP – Lab Audits	6	1	09/18/02
R Performance Audit Procedures for Carbonyl Samplers (8202, Canisters, Lab, Through-the-Probe)	20	2	05/07/02
S Performance Audit Procedures for Meteorological Parameters			
S.1 - %RH and Dew Point Sensors	8	1	08/23/02
S.2 – Wind Speed Sensors	18	1	08/23/02
S.3 – Wind Direction Sensors	30	2	08/23/02
S.4 – Ambient Temperature Sensors	12	2	08/23/02
S.5 – Barometric Pressure Sensors	8	1	08/23/02
S.6 – Solar Radiation Sensors	9	1	08/23/02
T Performance Audit Procedures for Total Suspended Particulate Toxic Metal Lab Audits	5	1	09/27/02
U System Audit Procedures for PM10 Mass Analysis	28	1	01/15/03
V Performance Audit Procedures For Continuous PM10 Monitors	17	2	09/27/02
W Performance Audit Procedures for	11	2	05/10/02

X	Performance Audit Procedures	13	1	05/07/02
Y	Quality Assurance Project Plan For the PM2.5 – Ambient Air Monitoring Program at State and Local Air Monitoring Stations (SLAMS)	181	1	10/30/01
Z	Performance Audit Procedures For PM2.5 Samplers	31	2	06/10/02
AA	System Audit Procedures	27	0	01/15/99
AB	System Audit Procedures for Dichotomous PM10 Sampling and Analysis Program	21	0	05/01/99
AC	Ambient Air Comparison Check Procedures for Non-Methane Hydrocarbon Compounds	17	1	09/03/02
AD	Performance Audit Procedures for Through-the-Probe Carbonyl Audits	10	1	05/10/02
AE	Site Survey Programs for Ambient Air Monitoring Stations	22	1	08/01/02
AF	System Audit Procedures for PAMS Sampling and Analysis Programs	18	0	03/16/01
AG	System Audit Procedures for Pesticide Monitoring Programs	16	0	07/31/01
AH	System Audit Procedures for Ambient Air Monitoring Programs	64	0	08/06/02